

**BY ORDER OF THE
SECRETARY OF THE AIR FORCE**

**AIR FORCE INSTRUCTION 11-5FT,
VOLUME 3**



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Flying Operations

***SMALL UNMANNED AIRCRAFT SYSTEMS
(SUAS) FLIGHT TEST OPERATIONS
PROCEDURES***

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This publication implements Air Force Policy Directive (AFPD) 11-5, *Small Unmanned Aircraft Systems (SUAS) Rules, Procedures and Service*; and AFI 11-502, *Small Unmanned Aircraft Systems Training, Standardization/Evaluation Programs, and Operations*. It provides guidance and procedures for Small Unmanned Aircraft Systems (SUAS) in Air Force Materiel Command (AFMC) and US Air Force Academy (USAFA). It applies to individuals at all levels who operate Group 1, Group 2, or Group 3 SUAS for the purposes of Research, Development, Test and Evaluation (RDT&E) within or on the behalf of AFMC and USAFA, including the Air Force Reserve and Air National Guard (ANG). (AFMC and USAFA units operating SUAS for operational or training missions, not directly associated with RDT&E, operate under the appropriate AFI 11-5 Mission, Design, Series (MDS) instruction.) This AFI may be supplemented at any level, but all supplements that directly implement this publication must be routed to the OPR for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*, route AF Forms 847 from the field through the appropriate functional chain of command. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, Table 1.1 for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW Air Force Records Disposition Schedule (RDS) located in the Air

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Chapter 1

GENERAL INFORMATION

1.1. Scope. AFMC produces a three-volume set of Flight Test (FT) instructions containing attachments for each SUAS Group flown in AFMC. These instructions are numbered AFI 11-5FT Volume 1, 2, and 3, and contain the training, evaluation criteria, and operations procedures, respectively, for each SUAS Group. AFMC uses these instructions in lieu of AFI 11-5 Group-specific Volumes for Research & Developmental Test and Evaluation (RDT&E) flying operations. In the absence of published guidance, AFMC units will coordinate through AFRL/DO with HQ AFMC/A3V for approval of locally developed guidelines. If possible, these guidelines will be consistent with similar guidance specified in the appropriate AFI 11-5 Group-specific lead MAJCOM Volumes.

1.2. Recommended Changes. Send comments and suggested improvements to this volume on AF Form 847, *Recommendation for Change of Publication*, through AFRL/DO to HQ AFMC/A3V, 508 W. Choctawhatchee Avenue, Suite 4, Eglin AFB FL 32542-5713. HQ AF/A3/5 will approve all interim changes to this instruction.

1.3. Waivers. Unless otherwise specified in this instruction, HQ AFMC/A3V is the waiver authority for this instruction. All waivers will be routed through appropriate operations channels to SUAS operating unit commanders, and the appropriate AFMC SUAS Flight Operations Authority (FOA) providing overall flight operations oversight, prior to submission to HQ AFMC/A3V. Use an AFMC Form 73, *AFMC Flight Operations Waiver Request*, to process the waiver.

1.3.1. Tier requirements refer to waiver authority based on level of risk.

1.3.1.1. "Tier 0" (T-0) requirements are reserved for requirements that non-compliance is determined and waived by respective non-Air Force authority.

1.3.1.2. "Tier 1" (T-1) requirements are reserved for requirements that non-compliance may put airman, mission, or program strongly at risk, and may only be waived by the MAJCOM/CC or delegate with concurrence of publication approver. When multiple MAJCOMs are affected, then T-1 is appropriate.

1.3.1.3. "Tier 2" (T-2) requirements are reserved for requirements that potentially put the mission at risk or potentially degrade the mission or program, and may only be waived by the MAJCOM/CC or delegate.

1.3.1.4. "Tier 3" (T-3) requirements are reserved for requirements that non-compliance has a remote risk of mission failure, and may be waived by the Wing/CC but no lower than the OG/CC.

1.4. Unit Supplements. Email unit supplements through AFRL/DO to AFMC/A3V for review and approval prior to publication. Approved unit supplements to AFI 11-5FT Volume 3 will be published by AFMC/A3V.

1.5. Research, Developmental and Test SUAS. Aircraft operations for research, developmental, and test SUAS will be conducted IAW this instruction and approved test plans.

New SUAS Group-specific attachments will be created when warranted. New SUAS-specific attachments may be created when the SUAS reaches a maturity level that warrants inclusion.

1.6. Inter-fly. Inter-fly is the exchange and/or substitution of SUAS operator members and/or aircraft systems between commands or other organizations outside of AFMC. AFMC operator inter-fly approval authorizations are governed by AFI 11-5FT Volume 1. Inter-fly involving the transfer of aircraft between MAJCOMs must be coordinated and approved through HQ AFMC/A3O. (T-2)

1.7. Applicability. AFMC SUAS research and developmental testing of small unmanned aircraft systems (SUAS), ground control station (GCS) and associated technologies is principally conducted by AFRL. This instruction applies to all SUAS research flight test activities including experiments and demonstrations that involve AFMC assets (full or part ownership), AFMC personnel (government, military, or contractor) or are AFMC funded (full or in-part). This Instruction outlines the procedures for operation under most circumstances and shall be used in conjunction with other Unmanned Aircraft Systems (UAS) or Unmanned Aircraft (UA) governing directives, Air Force approved AFRL flight test plans, UAS/Unmanned Aerial Vehicle (UAV)/UA manufacturer instructions, contractor-derived operating instructions, Federal Aviation Administration (FAA) Certificate of Authorization (COA), applicable USAF, Navy, Army, Marine Corp or DoD directives as well as Federal Air Regulations, and International Civil Aviation Organization (ICAO) Standards and Recommended Practices. Operations or procedures not specifically addressed may be accomplished if they enhance safe, effective mission accomplishment. The terms “air vehicle” and “unmanned aircraft” may be used interchangeably, both mean the airborne portion of the system that operates in the air.

1.8. Crew. The crew is defined as the personnel responsible for safe operation of the SUAS aircraft and mission. Training requirements for these positions can be found in AFI 11-502 Volume 1 and AFI 11-5FT Volume 1.

1.8.1. Test Conductor. Equivalent to a Mission Commander (MC) for the mission. Responsible for crew coordination and over-all flight test mission execution. Final decision authority for test issues. Responsible for coordinating multiple air vehicle operations. The individual selected as test conductor must undergo training and be annotated on the unit Letter of X's.

1.8.2. SUAS Operator (SUAS-O). Controls the SUAS by commands given through an autopilot (known as the Internal Operator) or directly manipulates flight controls and engine power through radio control (R/C) (also known as the External Operator). See AFI 11-5FT Volume 1 for further distinctions between the two. The SUAS-O is responsible for the airborne control function of the unmanned air vehicle, assembling and verifying positive control of the ground station and/or remote control unit, loading and/or final verification authority for flight plans, and monitors the health, performance and position of the aircraft. The SUAS-O may also act as a radio operator, monitoring and making appropriate radio calls to ground or air control tower, range operations or other personnel involved with the flight or ground operation. Military, government civilian, and contractor pilots operating USAF SUAS will be trained and qualified IAW this Instruction and AFI 11-5FT Volumes 1 and 2.

1.8.2.1. Pilot in Command Authority. The Lead SUAS-O (Pilot in Command-equivalent) is ultimately responsible for the safe operation of the aircraft. SUAS-O's act as the Lead SUAS-O of SUAS when they are the primary controller. Each aircraft must

have a dedicated Lead SUAS-O at all times. Although test requirements may call for a SUAS-O to control more than one aircraft at a time, SUAS-Os may not serve as Lead SUAS-O for two or more aircraft simultaneously unless approved to do so by the waiver authority for this Instruction. (T-2)

1.8.2.2. Lead SUAS-O (PIC). Unless SUAS pilot qualification training is being conducted, only one controller at a time can be designated and log Lead SUAS-O time. The terms “pilot” and “operator” may be used interchangeably but there shall only be one Lead SUAS-O/Pilot-in-Command-equivalent of a vehicle (or multiple vehicles) at any given time. Commonly a radio control operator acting as Lead SUAS-O may takeoff, land and handle in-flight emergencies (especially loss of ground station control) while handing off control to the ground control station operator for conduct of the test mission. Proper management of who is in control and acting as Lead SUAS-O of an air vehicle, as well as hand-off procedures between the Lead SUAS-O and other air vehicle operators during mission execution, must be briefed before any test and is the responsibility of the Test Conductor to ensure there is no confusion. See [paragraph 5.9](#) for standard transfer of aircraft control procedures.

1.8.3. SUAS Payload Operator. The SUAS Payload Operator may operate any sensor, test article, or other payload during the test. They may also act as a Flight Test Engineer (FTE) and monitor health sensors for propulsion, electrical, hydraulics or other components of the flight test air vehicle. Other functions might include assisting the SUAS-O and Test Conductor in the conduct of the flight, by reading and accomplishing assigned checklists, or acting as a designated radio operator, by monitoring and making appropriate radio calls to ground, control tower, Range Operations or other personnel attached involved with the flight operation. Specific Payload Operator duties for a given SUAS mission shall be briefed and thoroughly understood before the start of the mission.

1.8.4. Ground Support. This crewmember assembles the air vehicle and launch/recovery mechanism, fuels/de-fuels the air vehicle, installs battery, tensions and operates catapult for launch, assembles and maintains recovery systems, and provides general maintenance or repair to the air vehicle. They may start engines and install payload under the supervision of the Lead SUAS-O. Due to the unique differences possible in SUAS Groups, each test plan will specify detailed training for Ground Support personnel that is specific to each SUAS being used in that test plan. Ground Support personnel will not perform duties without receiving and documenting test plan specified training. AFRL/DO can also request approval from AFMC/A3V for Ground Support training plans that are independent of any test plans.

1.8.5. Observers. Dedicated observers assist the SUAS-O in duties associated with safe aircraft separation, terrain/obstacle clearance avoidance, and cloud clearance. Chase pilots (airborne Observers), if used, may not concurrently perform Observer or SUAS-O duties along with chase pilot duties while operating outside Restricted, Prohibited, or Warning Areas. See AFI 11-502 Volume 3, paragraph 10.6. for additional specifics on Observer requirements and duties. A FAA Certificate of Authorization may levy additional requirements on Observers. (T-3)

1.9. SUAS System Considerations.

1.9.1. Onboard Cameras/Sensors: Although onboard cameras and sensors that are positioned to observe targets on the ground have demonstrated some capability, their use in detecting

airborne operations for the purpose of air traffic deconfliction is still quite limited. In general, current designs are not mature and have shown to be insufficient to provide the sole mitigation for “see and avoid” equivalency. Although these systems are currently immature, applicants may be allowed to propose any system solution that provides a mitigation strategy and will be evaluated as a potential solution.

1.9.2. Radar and Other Sensors: If special types of radar or other sensors are utilized to mitigate risk, the applicant must provide supporting data which demonstrates that both cooperative and non-cooperative aircraft, including targets with low radar reflectivity, such as gliders and balloons, can be consistently identified at all operational altitudes and ranges, and the proposed system can effectively avoid a potential collision.

1.9.3. Lost Link Procedures: In all cases, UAS must be provided with a means of automatic flight termination or backup recovery in the event of a lost command link. There are many acceptable approaches to satisfy the requirement. The intent is to ensure airborne operations are predictable and containable in the event of lost command link.

1.9.4. Flight Termination System (FTS): It is highly desirable that all SUAS tests have system redundancies and independent functionality to ensure the overall safety and predictability of the system. If a UAS is found to be lacking in system redundancies, an independent flight termination system that can be activated manually by the UAS Lead SUAS-O may be required to safeguard the public. The approval authority for flying a SUAS without FTS is AFRL/CV. (T-2)

Chapter 2

MISSION PLANNING

2.1. General. SUAS Operators are ultimately responsible for ensuring all mission planning materials are current and command guidance is followed. A Lead SUAS Operator will be designated for all SUAS missions. All crew members must be present for mission planning unless released by the Lead SUAS-O. SUAS RDT&E Flight Operations, covered by this instruction and consisting of one or more missions, including taxi, shall only be conducted IAW an approved test or training plan. Mission planning, briefing, and debriefing are required activities.

2.1.1. The Test Conductor is responsible for briefing and developing the test plan. Mission planning and briefing are two separate activities. The Test Conductor and Lead SUAS-O will jointly review test plans to ensure safety and mission effectiveness. Personnel other than the crew flying the mission may accomplish mission planning; however, the Lead SUAS-O is responsible for ensuring that the mission planning is complete and accurate.

2.2. Mission Planning Requirements. The unit commander must ensure that a flight operations area is available with adequate space for operations management, flight planning/briefing, and required publications. The unit commander will ensure that SUAS operators are provided the following:

2.2.1. Mission requirements and schedule of events.

2.2.2. Briefing facilities and aids described in **paragraph 2.9**.

2.2.3. Appropriate regulations and flight manuals (including Partial and Modification Flight Manuals (MFMs)) must be located in the unit. A current copy (paper or electronic) of all applicable flight manuals and technical orders is required in the FCIF library and Operations Supervisor's (or unit equivalent) desk. If a conventional paper copy of a flight manual is not available through distribution or local printing, then two independent methods of accessing the electronic flight manual must be available that have been verified to be current and operational. Refer to AFI 11-502 Vol 2 and AFMC Sup 1 for FCIF library requirements. Refer to AFI 11-202 Vol 3, AFMC Sup 1, for additional details on electronic FCIF libraries.

2.3. Air Vehicle Performance Data. All Air Vehicle Performance Data relevant to the mission to be flown, including fuel quantity, rates of fuel consumption, runway distances required for takeoff and landing, shall be available and consulted during mission planning.

2.4. Mission Planning Materials. Maps and Charts. Current Maps and Charts, of sufficient accuracy and appropriate to the missions being flown, shall be used for mission planning. A local area map of sufficient detail to remain within assigned flight test operational areas will be available to crewmembers. The most recent maps will be loaded into the GCS.

2.4.1. In-flight Manuals/Directives. The Lead SUAS-O will ensure that applicable flight manuals, checklists, and mission related directives (if required) for all mission required crew positions are readily accessible during SUAS ground and flight operations. The responsible FOA will determine required mission and mission-related directives. If a conventional paper copy of a flight manual is not available through distribution or local printing, then two

independent methods of accessing the electronic flight manual that have been verified to be current and operational must be available to the crew.

2.5. Local SUAS Operator Aids. SUAS Operator Aids may be published and will be tailored to aid the unit in performing its mission. Unit SUAS Operator Aids may be tailored for each Mission Design Series (MDS)-equivalent or RDT&E SUAS as necessary. The following areas are recommended for inclusion:

- 2.5.1. Airfield and standard operations setup diagrams.
- 2.5.2. Local radio channelization.
- 2.5.3. Takeoff and landing data.
- 2.5.4. Weight and balance data.
- 2.5.5. Impoundment procedures.
- 2.5.6. Emergency action checklists.
- 2.5.7. NORDO (Loss of team radio communication with range/Air Traffic Control) procedures.
- 2.5.8. Recovery procedures with releasable stores/weapons onboard and jettison areas.
- 2.5.9. Alternate recovery areas and procedures.
- 2.5.10. Other information as deemed necessary (e.g. canned airspace/flight plans, turnaround procedures, local training areas, systems and lost-comm programming preflight, etc).

2.6. Test Cards. Flight test cards will be constructed and approved according to local procedures. A copy of the test cards will be filed with a SUAS operations supervisor for reference.

2.7. Briefing/Debriefing Room Requirements. Use of adequate briefing room and materials is required for initial mission briefs. Follow-on briefings and/or update briefing locations will be at the discretion of the Lead SUAS-O. Briefing rooms will be private and of adequate size to seat required crewmembers and test team members. They may be multipurpose rooms, but privacy must be ensured during SUAS operation mission briefings. Briefings will utilize, electronically or otherwise:

- 2.7.1. Briefing guides for applicable missions and supplemental material as locally determined, such as Emergency Procedure of the Day lists, etc.
- 2.7.2. A dry-erase board or suitable substitute.
- 2.7.3. Visual aids (such as slide display boards, charts, briefing books, viewgraphs, computer display, etc.) to adequately present, as applicable to the test team, the following:
 - 2.7.3.1. Airfield diagrams depicting runways, taxiways, parking areas, and other special use areas as appropriate.
 - 2.7.3.2. Training rules (air-to-air, air-to-ground, chase, intercept, low level, etc.), when appropriate.
 - 2.7.3.3. Local area charts depicting the planned flying area; VFR patterns, including entry and departure procedures; special use airspace; alternate airfields; air-to-air, air-to-

ground, Functional Check Flight (FCF), jettison, drop zone or salvo areas normally used by the unit.

2.8. Briefing/De-briefing.

2.8.1. Mission Brief/Debrief. The Lead SUAS-O is responsible for presenting a logical briefing to all crewmembers that promotes safe, effective, mission accomplishment. A structured, logical debrief of the test flight will be conducted at the completion of each mission. Use briefing guides to provide a reference list of items that may apply to particular missions. Items listed may be briefed in any sequence. The extent and depth of the briefings will depend on the type of flight, complexity of the tests and equipment, previous mission and flight crew experience. These requirements are specified in AFI 11-502 Volume 3 para 2.4 and/or AFI 11-502 Volume 3 AFMC Sup 1.

2.8.2. Standards. Those briefing items understood by all participants may be briefed as "standard". Units may use standards as long as they are in a published document. However, during sorties where trainees or unassigned personnel are in the flight, all items will be briefed.

2.8.3. All crewmembers and required test support personnel will attend the flight briefing unless previously briefed and excused by the Lead SUAS-O.

2.8.4. All aspects of the test plan will be thoroughly briefed by the Lead SUAS-O or Test Conductor to include mission and test objectives. Briefings will include actions to terminate the flight test profile if required. Each flight will brief an alternate mission, if applicable. The alternate mission will be less complex than the primary. Briefed mission elements and events may be modified and briefed airborne as long as flight safety is not compromised. Missions or events not briefed prior to mission execution will not be flown. Flight leads will ensure changes are acknowledged by all flight members.

2.8.5. If the flight briefing was conducted prior to the day of the flight, the Lead SUAS-O will ensure all members are briefed on current and forecast weather, NOTAMs, and any mission changes prior to stepping to the aircraft/GCS.

2.8.6. Operators will debrief all missions. The debriefing will be conducted in a location with suitable tools to debrief, at a minimum, an evaluation of the mission objectives, test objectives, lessons learned, and execution errors. Operators will debrief weather conditions to weather personnel when weather encountered during the mission was not as forecast.

2.8.7. In-flight Changes. Do not fly un-briefed tests and/or events. If necessary, mission elements and events may be modified while the SUAS is airborne as long as changes are within scope of the approved flight test plan and do not compromise flight safety. The Test Conductor will ensure all crewmembers understand any changes.

2.8.8. A Go/No-Go and Operational Risk Management (ORM) checklist will be completed by the Test Conductor with all crewmembers available.

2.9. Bird Avoidance. Generally, the hour before and after sunrise and sunset presents an increased threat of a bird strike, with migration seasons posing a significant hazard at different times. Pilots will follow locally developed BASH procedures as well as those outlined in AFPAM 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Techniques* to minimize aircraft exposure to bird strikes.

2.10. Normal/Minimum/Low/Emergency Landing Fuel/Battery Charge. Plan to arrive into the traffic pattern for landing/recovery at the intended location (on initial, normal straight-in approach descent point, or downwind, as appropriate for aircraft type) and land with no less than the AFI 11-502 Volume 3 required Normal Fuel or battery reserve. Normal, Minimum, and Emergency Fuel/battery capacity is defined in [Attachment 1](#). If it becomes apparent an aircraft will land with less than the required Normal Fuel or battery charge, SUAS-Os shall declare “Minimum Fuel” to the test team and with ATC and Range Control, if applicable. If it becomes apparent an aircraft will require priority traffic routing due to a low fuel state or battery capacity, pilots shall declare “Emergency Fuel” to the test team, ATC, and Range Control, as applicable. **CAUTION:** Consider that by using the words, “Emergency Fuel” with ATC, an inflight emergency is automatically declared, taking the right-of-way over all other air traffic, impacting other ATC-controlled operations in the vicinity, and activating traditional “crash net” (fire, rescue, medical, flight safety) services. Consideration of hazards created to others must be factored into a decision to use the “Emergency Fuel” term and by declaring an emergency with ATC for a SUAS system. Preservation of the SUAS is not paramount, and crew actions must not present or create a greater hazard to other air traffic.

2.11. Minimum Runway Lengths. For developmental aircraft, minimum runway length will be described in the aircraft-specific safety package.

Chapter 3

MISSION GUIDANCE

3.1. General. This chapter contains guidance that applies to all AFMC SUAS operations. SUAS system-specific guidance may be contained in this instruction's attachments where applicable. This chapter is divided into five sub-sections: Common, Tactical and Systems, Air-to-Air, Air-to-Surface and Low Altitude, and Flight Test Missions.

3.1.1. The test and safety review process does not have authority to grant exception to this or any other AFI.

3.2. Common Mission Operations.

3.2.1. Preflight

3.2.1.1. Preflight checklists. All crewmembers will successfully complete air vehicle specific preflight checklists. Checklists shall be included in the flight test plan.

3.2.1.2. Engine Starts. The engine will only be started at the command of the SUAS-O who is Lead SUAS-O for takeoff. Engine start may be accomplished by Ground Support personnel trained in the safe startup of the engine, being sure to avoid contact with spinning propeller (if applicable).

3.2.2. Launch Operations

3.2.2.1. Catapult/Launch System Operations. The Lead SUAS-O for takeoff is responsible to ensure the area in front of the launch system/catapult is clear of any personnel before launch. Hazard zones shall be identified in the test plan, appropriately marked, and briefed to all personnel present. The Air Vehicle will only be launched at the command of the Air Vehicle Operator who is Lead SUAS-O for takeoff. Ground Support personnel will be trained and certified in the correct operation of the launch system, and all launch systems will be operated per manufacturer's instructions or as outlined in the flight test plan.

3.2.2.2. Runway takeoffs. The Lead SUAS-O for take-off is responsible to ensure the runway is clear for takeoff, is long enough and wide enough for flight operations and clearance of ground objects. Lead SUAS-Os must coordinate with any ground control personnel in a multi-use runway environment. Maintain safe taxi speeds at all times. Crews are allowed to perform high speed taxi checks as the test mission dictates.

3.2.2.3. Hand Launching. Hand launching takeoff will only be accomplished by trained personnel physically capable of launching the air vehicle. Proper care must be taken to avoid propeller contact and contact with hot engine components. Appropriate personal protective equipment (PPE), as determined by safety guidance or the flight manual, will be used for launch. The Lead SUAS-O for takeoff must coordinate verbal commands for launch with the Ground Support personnel responsible for the hand launch of the vehicle.

3.2.2.4. Accomplish sufficient operational checks to ensure safe test mission accomplishment. As a minimum, time between operational checks will not exceed one hour. Minimum items to check are communications links, engine operation, total fuel

quantity or battery status, and aircraft position. Checklists, and the flight test plan including test cards, are required to be at the test site and to be followed.

3.2.3. Flight Operations

3.2.3.1. All flight operations will be conducted IAW applicable governing directives, Federal Air Regulations (FARs) when operating within the United States (including airspace overlying the waters out to 12 miles from the US coast unless the Federal Aviation Administration has excluded military operations), ICAO Standards and Recommended Procedures (SARPs) in international airspace over the high seas, approved AFRL flight test plans, UAS/UAV manufacturer instructions, contractor derived operating instructions, FAA Certificate of Authorization (COA) and applicable USAF, Navy, Army, Marine Corp or DoD flight operation directives. (T-2)

3.2.3.2. Deviations.

3.2.3.2.1. Mission Aborts. Abort the mission, regardless of apparent damage or subsequent normal operation, for any of the following: mid-air collision, bird/object strike, flight control system anomalies, or failure of any engine.

3.2.3.2.2. When deviating from flight rules or Air Traffic Control (ATC) instructions, a report shall be made by the test conductor to ATC or range operations before or during the event, and inform the applicable Flight Safety Office within eight hours. Additionally, comply as necessary with AFI 11-502 Volume 3 paragraphs 1.10 through 1.13.

3.2.3.2.3. At any time, any crewmember seeing a variation of 200 feet altitude, a deviation of ± 20 knots, or a potential safety or terrain obstruction problem will immediately notify the SUAS-O in control of the aircraft.

3.2.3.2.4. During critical phases of flight (as defined in the Appendix), SUAS-Os will ensure communications are sanitized to mission essential conversations. The crew will alert the SUAS-O of all deviations from prescribed procedures or from the maneuver being flown. Momentary deviations do not require corrective calls as long as immediate corrective actions are being undertaken.

3.2.4. Landing/Recovery Operations

3.2.4.1. Landings/Recoveries will be accomplished IAW UAS/UAV manufacturer instructions and/or flight test plan guidance. Unless otherwise specified in a mission plan, the normal procedure is to bring the UAS into visual range for landing/recovery. The Lead SUAS-O for landing/recovery is responsible to ensure the landing/recovery zone is clear of any personnel before beginning the approach. Hazard zones shall be identified in the test plan, appropriately marked, and briefed to all personnel present.

3.2.4.2. Touch and Go landings are authorized in AFMC, subject to the following restrictions, and SUAS-system-specific attachments. Waivers will be submitted through AFRL/DO to AFMC/A3V IAW Para 1.3. (T-2)

3.2.4.2.1. Day only with a Fully Mission Capable (FMC) SUAS having no malfunctions or live weapons/stores.

3.2.4.2.2. Authorized for SUAS-O training and proficiency only (no touch and go landings for non-SUAS-O personnel).

3.2.4.2.3. A current and touch and go qualified SUAS Instructor (SUAS-I) must be present with an unqualified SUAS-O or a SUAS-O must meet the instructor experience requirements. When a SUAS-I is required, the instructor will have access to an additional set of controls or be in a position to immediately intervene with the primary set of controls.

3.2.4.2.4. Touch and Go practice and procedures to be followed will be briefed during the mission briefing and before commencing touch and go landings.

3.2.4.2.5. All engines will be used for takeoff or go-arounds.

3.2.4.2.6. When equipped with high-cost payloads or unique test articles, use good judgment in considering the added risks in deciding whether touch and go landings are appropriate.

3.2.4.3. Landings with a net or other arresting recovery system. All personnel shall remain clear of aircraft recovery systems in accordance with manufacture's guidelines and procedures established in approved test plans.

3.2.5. Weather Minimums, Restrictions, and Planning Factors. All flights shall be conducted IAW AFI 11-502 Vol 3 weather minima throughout the planned route of flight. The following additional sources may be utilized in determining weather conditions at non-military airfield test sites: airport control tower, regular and special weather reports obtained through DUATS (if available), Flight Service Station, Military Weather Services and GCS installed weather systems. Where possible, estimates of ceiling and visibility using obstacles or terrain features at known distances from the test site shall be used as an additional source of information. Maximum crosswind component for each UAS air vehicle will not be violated unless the maneuver is part of an approved test plan. No SUAS flight test operations are to occur during a thunderstorm. Plan and fly all missions to avoid areas of known or forecast severe weather including severe icing or severe turbulence. These restrictions do not apply to planned severe weather penetration with appropriate AFMC/A3V waivers as part of an approved test plan. All flight and ground operations are prohibited when lightning is reported within five (5) NM of the test area. All flight and ground operations are prohibited if thunderstorms are producing hazardous conditions such as hail, strong winds above 30 knots, heavy rain or lightning. (T-2)

3.2.5.1. Category 1 and 2 UASs receive general weather support from authorized weather sources. Category 3, and higher, receive direct weather support from weather flight personnel or a servicing Operational Weather Squadron (OWS) if no weather flight is assigned. To determine the servicing OWS, refer to the flight information handbook (FIH) or Air Force Visual Aid (AFVA) 15-137, *Air Force Operational Weather Squadron Areas of Responsibility*.

3.3. Tactical and Systems Mission Operations.

3.3.1. AFMC SUAS do not have a tactical mission or typical need for such activities such as Aerial Refueling, Advanced Handling Characteristics/Maneuvers (AHC/AHM), formation flying, night flying, or advanced airborne human systems integration. If a research or test

need arises to conduct such activities, procedures for safe training and operation shall be outlined in the flight test plan.

3.3.2. Functional Check Flights. Conduct of all SUAS functional check flights will be as part of an approved test plan. When an aircraft has original equipment modified or new equipment added that is not covered by USAF technical orders, the contractor or responsible test organization will provide FCF or airworthiness verification procedures. The need for FCF after minor maintenance or modification will be determined by the aircraft maintenance activity. For developmental aircraft, the aircraft manufacturer or contractor will define formal FCF/Acceptance Check Flight (ACF) procedures. (T-3)

3.3.2.1. Use of Check Flight Cards. Unit developed functional check flight cards may be used as part of an approved test plan.

3.3.2.2. FCFs will be conducted in Military or Special Use Airspace. Waivers to this requirement will be submitted to the FAA (FAA COA).

3.3.2.3. Flight Conditions. FCFs and preflight inspections for FCFs will be accomplished during daylight hours. Comply with any further weather minima specified in the specific SUAS operating manual, and if applicable, SUAS system-specific attachments to this instruction.

3.3.2.4. Combined FCF Flights. FOAs may authorize the combination of FCFs with other mission/training flights if the FCF is being conducted to evaluate auxiliary aircraft systems.

3.3.2.5. Aircraft Release. If a malfunction occurs during an FCF, which is not related to the condition or modification generating the FCF, and the original condition operationally checks good, the aircraft may be released for flight pending resolution of the new malfunction. This applies primarily to partial FCFs for specific modifications, and not to first-flight or post-major maintenance/overhaul FCFs.

3.3.3. Sensor/Payload Operations. Sensor/Payload operators are crew members who operate systems on the aircraft which cannot affect the flight direction or control of the aircraft. Onboard sensors/payloads may be camera systems, radar systems, electronic intelligence (ELINT) systems, other datalink or communications systems not related to the flight control of the aircraft, or chemical/biological sniffing devices. Sensor/Payload operators will have proper training for the specific system under test and will operate under the supervision of a Lead SUAS-O, abiding by all guidelines and restrictions as defined in this instruction and approved test plans.

3.3.4. Night/NVG operations. Night operations are not typical for AFMC SUAS research activities. If a research or test need arises to conduct such activities, procedures for safe training and operation shall be outlined in the flight test plan. This section is reserved for future use.

3.4. Air to Surface Employment.

3.4.1. Stores Release/Weapons Delivery. This chapter describes procedures for SUAS operator air-to-surface training and is applicable to all AFMC SUAS. Weapons delivery training will be IAW AFI 13-212, Volume 1, *Range Planning and Operations*, and if they exist for the system, T.O. 1M-34, *Aircraft Weapons Delivery Manual*, and aircraft specific -

34 T.O.s. AFI 11-214 provides procedures for air-to-surface training for MAJCOMs with tactical missions. AFMC does not have a tactical mission, but invokes AFI 11-214 for air-to-surface training. Developmental air-to-surface testing will be conducted in accordance with test and safety review board guidance.

3.4.1.1. Drop Procedures. Units conducting aerial delivery operations will develop specialized training programs and operational procedures, either in the test plan or additional unit-published procedures if of a repetitive nature. Submit these training plans and/or operational procedures to AFMC/A3V for review.

3.4.1.2. Target Identification. Operators must positively identify the drop zone/target and ensure correlation with guidance and targeting systems prior to stores/weapons release. For example, a pilot may visually identify a target, but must ensure the sensor controlling the point of impact (targeting pod, radar, etc.) will direct the store/weapon to the identified area/target. When delivering stores/weapons via an INS and/or GPS solution without visual identification of the target (through a cloud deck, in IMC, at night, etc.), target identification and correlation is defined as verifying the target coordinates and navigation solution respectively, while airborne.

3.4.1.3. Air-to-Surface Operations. AFMC SUAS operators will not conduct simulated or actual weapons employment without completing an AFMC/A3V approved weapons employment training plan. SUAS operators will not control more than one SUAS while employing ordnance, both simulated and live.

3.4.1.4. Minimum Altitudes. Comply with restrictions and minimum release and recovery altitudes as specified in the specific SUAS operating manual and approved test plan.

3.4.1.5. Flight Composition. Dissimilar aircraft may execute deliveries on the same range provided the delivery events are compatible with each type of aircraft and AFI 11-214 delivery spacing restrictions are followed.

3.4.1.6. Live Ordnance Procedures.

3.4.1.6.1. Conduct a thorough and complete verification of all target data.

3.4.1.6.2. No release system, indicator, or weapon bay door malfunction may exist.

3.4.1.6.3. Weapon Unlock/Release Enable/Master Arm to Arm will not be completed until the aircraft is within the designated bombing range.

3.4.1.6.4. If all weapons are expended and release is verified visually (pilot observation of impact, by the Range Control Office (RCO), or other flight members) and internal indications are consistent with outside observations, SUAS operators may conduct additional training without restriction.

3.4.1.6.5. Do not make simulated weapon delivery passes on targets occupied by personnel unless approved by the SUAS unit commander. Simulated weapon attacks with live ordnance is prohibited.

3.4.1.7. Class B/C Ranges. When Ground Controllers are operating on Class B/C ranges the following procedures apply:

3.4.1.7.1. All SUAS-Operators will be familiar with applicable range weapons delivery procedures, appropriate targets and weapons footprints.

3.4.1.7.2. Ground personnel locations will be briefed and acknowledged by all operators.

3.4.1.7.3. Operators will not expend ordnance if any doubt exists as to the ground personnel or intended target locations.

3.4.1.8. Battle Damage/Bomb Checks. Unless circumstances prevent, SUAS-Os will direct a battle damage/bomb check prior to or during return to base (RTB). This visual check is mandatory following the expenditure of live ordnance (including all types of gun ammunition). Ground observers may accomplish these checks, if required. This check may be accomplished using on-board sensors if applicable.

3.4.1.9. Armament System Malfunctions. Operators will not attempt to expend stores/ordnance using a delivery system with a known stores/weapons release malfunction, unless following hung store/ordnance procedures.

3.4.1.10. Inadvertent Release. Record switch positions and impact point (if known) at the time of inadvertent release and provide to armament and safety personnel. Check armament switches safe and do not attempt further release in any mode. Treat remaining stores as hung ordnance and obtain a chase aircraft during RTB, if practical. If remaining stores present a recovery hazard, jettison in a suitable area on a single pass, if practical.

3.4.1.11. Hung Store/Ordnance. Crews experiencing a hung store may contact the RCO for permission to release or jettison the hung stores in a suitable area. If a hung store cannot be jettisoned or released, or if the crew elects not to jettison, the crew will accomplish any required checklists and recover to the most appropriate location while avoiding over-flight of populated areas.

3.4.1.11.1. Refer to local guidance for recovery procedures with hung weapons. If the crew is required to land the SUAS with hung or unexpended weapons, at a location other than the planned base of operations advise the local authorities of the situation so that proper coordination can be accomplished with their safety office.

3.4.1.12. On-Range No Radio (NORDO) Procedures.

3.4.1.12.1. Attempt contact with the RCO on the appropriate back-up frequency, via telephone, or dedicated network chat. The method used must be pre-coordinated and briefed with the RCO. If unable to establish contact, make a pass by the range control tower (over the target if flying on an unmanned range) on the attack heading while rocking wings, and turn in the direction of traffic. Use of cell phones to re-establish team contact with the controlling agency/RCO may be acceptable if compatible with EMI and range restrictions.

3.4.1.12.2. If the NORDO aircraft has an emergency, and conditions permit, make a pass by the range control tower, on the attack heading while rocking wings, turn opposite the direction of traffic, and proceed to a suitable recovery base.

3.4.1.12.3. Unexpended Ordnance. If radio failure occurs and circumstances preclude landing with unexpended ordnance, accomplish a safe jettison of the ordnance.

3.4.1.12.4. Lost Link Procedures with Ordnance:

3.4.1.12.4.1. The Lead SUAS-O must ensure prior to the flight that lost link routing and profiles are compatible with a hung store situation, and remain on range and clear of populated areas.

3.4.1.12.4.2. If the SUAS lost link procedures allow the UA to perform an autonomous landing, SUAS operators must make special provisions for clearing the runway/landing zone prior to return of a UA with unexpended ordnance on all missions with weapons loaded.

3.4.2. Low Level Procedures. Developmental testing in the low level structure will be conducted in accordance with test and safety review board guidance.

3.4.2.1. Minimum Altitudes. Comply with restrictions and minimum altitudes as specified in the specific SUAS operating manual and approved test plan.

3.5. Air-to-Air Employment. This section is reserved for future use.

3.6. Flight Test Mission Guidance.

3.6.1. Flight Test Orientation. MDS specific guidance is provided in this instruction's attachments where required.

3.6.2. Target. Target operations refer to direct support missions that do not involve chase events. A chase qualification is not required to fly target events. In the absence of test or safety review board restrictions follow AFI 11-214 air-to-air guidance.

3.6.3. Chase. If manned Chase aircraft are required, see published procedures in AFI 11-2FT Volume 3.

3.6.4. Stores Release Testing. All weapons delivery guidance applies. Group specific guidance is provided in this instruction's attachments where required.

Chapter 4

INSTRUMENT PROCEDURES

4.1. Instrument Flight Rules. Current fielded Small UAS and SUAS-Os have neither the equipment nor training and certifications required to comply with procedures for operation under Instrument Flight Rules (IFR). Future systems intended to test/certify IFR capabilities must be preceded with developed and approved training programs.

Chapter 5

OPERATING PROCEDURES AND RESTRICTIONS

5.1. General. These procedures do not supersede flight manual guidance. Refer to SUAS Group attachments for additional aircraft specific operational limits and restrictions.

5.2. Technical Orders. With the exception of authorized flight test missions, personnel will not operate new equipment or modified aircraft without properly validated and verified tech data in accordance with 00-5 series T.O.s. Once validated by flight test, new equipment can be operated using test cards derived from an approved test plan if other tech data does not yet exist. Modified aircraft will be operated in accordance with the aircraft modification flight manual. (T-2)

5.3. Developmental Software. The aircraft chief of engineering or aircraft System Program Manager (SPM) must certify developmental software, including mission planning software for flight outside a test program. This certification may be delegated in writing to the responsible FOA with delegated oversight responsibility for programs not governed by SPMs. Under no circumstances will a flight outside of an approved test plan take place with software that has not passed a safety of flight evaluation.

5.4. New/Modified Aircraft Equipment/Weapons. SUAS-Os not qualified in the operation of new or modified aircraft equipment are restricted in operator duties. They will not operate that equipment on any flight unless under the supervision of a current and qualified instructor of like specialty qualified in that equipment. This restriction does not apply to aircraft and SUAS operators under a formal test plan who have completed the necessary training.

5.5. Aerial Demonstration/Show Formation. Refer to AFI 11-209, *Aerial Event Policy and Procedures*, AFI 11-246, *Air Force Aircraft Demonstrations*, and applicable MAJCOM directives for specific rules and appropriate approval levels to participate in static displays and aerial events.

5.6. Flight Duty Period (FDP). SUAS flight duty period restrictions are IAW AFI 11-502 Volume 3 and AFMC Sup 1.

5.7. Checklists. Notes amplifying checklist procedures or limitations may be added to the checklists. Checklist items that do not apply to the unit's aircraft or mission may be lined out.

5.8. Takeoff Aborts. Prior to flight, the Lead-SUAS will ensure that every member of the flight has reviewed and understands takeoff data. Place particular emphasis on takeoff and abort factors during abnormal situations such as short or wet runway operations, and heavy gross weights. Anytime an aircraft experiences a high speed abort, hot brakes should be suspected (if applicable). If confirmed, declare a ground emergency and taxi the aircraft to the designated hot brake area and perform hot brake procedures if necessary and applicable.

5.9. Standard Transfer of Aircraft Control (Handoffs/Handovers). Both SUAS-Os of aircraft utilizing more than one operator must communicate and know at all times who has control of the aircraft. When ready, the relinquishing SUAS-O will initiate transfer with the positive verbal statement "You take the aircraft (controls)." The SUAS-O receiving control of the aircraft will acknowledge "I have the aircraft (controls)." This standard also applies to unplanned transfers such as an instructor taking control, or during an emergency. Once

assuming control of the aircraft, maintain control until relinquishing it as stated above. If inter-operator communication (intercom, radio, etc.) fails, the Lead SUAS-O for that portion of the flight will assume control of the aircraft, and indicate such by a pre-briefed nonverbally apparent signal, such as rocking the wings. Non-standard terminology or procedures for transfer of aircraft control may be briefed as long as the methodology clearly distinguishes positive transfer of control from other actions such as ‘having’ the aircraft visually.

5.10. Unusual Attitudes and Training Maneuvers (non-aerobatic). Practice unusual attitude recoveries are prohibited at night, in IMC, with simulated/live weapons/stores, and any time the safety observer is not qualified in the aircraft. These maneuvers will only be accomplished when defined and required in an approved test plan. Initiate unusual attitude recoveries at an altitude that will allow safe recovery of the SUAS. Minimum unusual attitude altitudes will be published in the Group-specific attachments to this publication. Abrupt training maneuvers including intentional maneuvers involving an abrupt change in aircraft attitude, abnormal attitude, or abnormal accelerations or decelerations not necessary for normal flight are subject to the same restrictions.

5.11. Simulated Emergencies. Do not practice emergency procedures that degrade aircraft performance or flight control capabilities unless specifically authorized by an approved training syllabus or test plan. In addition to the restrictions in AFI 11-502 Volume 3, the following restrictions apply: (T-2)

5.11.1. Ensure that specific pattern procedures for conduct of emergency training do not conflict with other flight patterns of other aircraft. If necessary to deconflict, coordinate letters of agreement (LOA) in advance with appropriate agencies and publish procedures in appropriate local publications. A simulated emergency will not be initiated or continued if a potential traffic pattern conflict exists which would require that the SUAS-O divide attention between practicing the emergency procedure and sequencing with traffic. In addition, simulated emergencies will be discontinued whenever excessive maneuvering is required, whether as a result of a traffic conflict or when making corrections.

5.11.2. During initial qualification or re-qualification sorties, the IP or EP will be at a second set of controls and in a position to direct a go-around, and/or take control, if needed.

5.11.3. Day VMC only.

5.11.4. Gross weight must not exceed basic weight plus weight of full internal fuel or flight manual limits, whichever is less.

5.11.5. No external ordnance, except training ordnance, may be carried.

5.11.6. Before initiating any simulated emergency, the Lead SUAS-O/IP/EP will brief the operations team on the condition to be simulated, and state “Simulated” over the intra-team communication system prior to establishing the simulated condition, and during accomplishment of each simulated emergency procedure. For all simulated emergency patterns, ensure radio transmissions to ATC comply with local procedures.

5.11.7. Simulated Engine Out patterns. The engine-out pattern may be entered from any direction or altitude that will ensure the aircraft is properly configured prior to base key and in a position to safely complete the approach. On glow or carbureted engines, avoid extended time at idle power settings by performing occasional engine clearing throttle-ups.

Full stop and touch-and-go landings may be flown by fully qualified SUAS-Os or by students under the direct supervision of a SUAS-Instructor/Evaluator, provided the approach is stabilized and the aircraft will land in the recommended touchdown zone. The aircraft must rollout wings level within a safe altitude above ground on final. Minimum airspeed during an engine-out traffic pattern is stall speed plus 10 knots KIAS. Terminate the engine-out pattern if airspeed decreases below the minimum stated or NLT 50 ft AGL if the aircraft will land short of the intended point of landing. If these parameters are not met, a go-around will immediately be performed. All engines will be used for unplanned go-around. Simulated Engine-Out climbout is not authorized (multi-engine aircraft). Once discontinued, and a go-around is initiated, no attempt will be made to re-enter or complete that pattern/approach.

5.12. Fuel Jettisoning/Dumping. Fuel jettisoning will be conducted only to reduce aircraft gross weight in an emergency, for operational necessity, or as required for flight test or FCF. When circumstances permit, jettison fuel over unpopulated areas at an altitude above 5,000 AGL, when feasible. Advise the appropriate air traffic control agency of intention, altitude, and location when fuel is jettisoned and when the operation has been completed. Units will establish jettison areas and procedures to minimize the impact of fuel jettisoning into the atmosphere. Use designated jettison areas and local area procedures to the maximum extent possible, except when safety of flight would be compromised. Refer to specific SUAS Group attachments for additional guidance, if applicable.

5.13. Dropped Objects. If an object inadvertently departs the aircraft, the flight crew will notify the controlling agency as soon as practical; include details of routing, altitude, winds aloft, etc. After landing, notify maintenance and initiate appropriate safety processes.

5.14. Hazardous Conditions. Relay any safety hazard (e.g. icing, turbulence, thunderstorms, bird concentrations etc.), through a Pilot Weather Report (PIREP) to the controlling agency.

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Deputy Chief of Staff, Operations

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 10-220 IP (DCMA INST 8210.1), *Contractor's Flight and Ground Operations*, 1 Mar 2007

AFI 10-220 IP (DCMA INST 8210.1), AFMC SUP, *Contractor's Flight and Ground Operations*, 6 Nov 2008

AFI 11-2FTV3, *Flight Test Operations Procedures*, 16 Nov 2011

AFI 11-202V1, *Aircrew Training*, 22 Nov 2010

AFI 11-202V1 AFMC SUP 1, *Aircrew Training*, 25 Jul 2011

AFI 11-202V2, *Aircrew Standardization/Evaluation Program*, 13 Sep 2010

AFI 11-202V2 AFMC SUP 1, *Standardization/Evaluation Program*, 12 Jul 2011

AFI 11-202V3, *General Flight Rules*, 22 Oct 2010

AFI 11-202V3 AFMC SUP 1, *General Flight Rules*, 25 Aug 2011

AFI 11-209, *Aerial Event Policy and Procedures*, 4 May 2006

AFI 11-209 AFMC SUP 1, *Aerial Event Policy and Procedures*, 29 Aug 2007

AFI 11-214, *Air Operations Rules and Procedures*, 14 Aug 2012

AFI 11-218, *Aircraft Operations and Movement on the Ground*, 28 Oct 2011

AFI 11-218 AFMC SUP, *Aircraft Operations and Movement on the Ground*, 21 Mar 2013

AFI 11-246V1, *Air Force Aircraft Demonstrations (A-10, F-15, F-16, F-22)*, 29 Sep 2008

AFI 11-246V5, *Air Force Aircraft Demonstrations (MC-130E/H/P, MH-53J/M)*, 26 Apr 2004

AFI 11-246V6, *Air Force Aircraft Demonstrations (C-17, C-130, C-141, C/KC/NKC-135, UH-1)*, 20 Apr 2004

AFI 11-246V7, *Air Force Aircraft Demonstrations (Sailplanes)*, 18 May 2011

AFPD 11-5, *Small Unmanned Aircraft Systems (SUAS) Rules, Procedures, and Service*, 17 Aug 2009

AFI 11-502V1, *Small Unmanned Aircraft Systems Training*, 26 Apr 2012

AFI 11-502V2, *Small Unmanned Aircraft Systems Standardization/Evaluation Program*, 26 Apr 2012

AFI 11-502V3, *Small Unmanned Aircraft Systems Operations*, 26 Apr 2012

AFI 13-212, *Range Planning & Operations*, 16 Nov 2007

Air Force Visual Aid (AFVA) 15-137, *Air Force Operational Weather Squadron Areas of Responsibility*

AFI 33-360, *Publications and Forms Management*, 25 Sep 2013

AFMAN 33-363, *Management of Records*, 1 Mar 2008

Forms Adopted

AF Form 847, *Recommendation for Change of Publication*

AFMC Form 73, *AFMC/A3V Waiver Request*

Abbreviations and Acronyms

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPAM—Air Force Pamphlet

AFPD—Air Force Policy Directive

AFMC—Air Force Materiel Command

AFRC—Air Force Reserve Command

AFSOC—Air Force Special Operations Command

AGL—Above Ground Level

ANG—Air National Guard

ATC—Air Traffic Control

COA—Certificate of Authorization

CONUS—Continental United States

DoD—Department of Defense

EP—Emergency Procedures/Evaluator Pilot

FAA—Federal Aviation Administration

FAR—Federal Aviation Regulation

FLIPI—Flight Information Publication

GCS—Ground Control Station

IAW—In Accordance With

ICAO—International Civil Aviation Organization

IFR—Instrument Flight Rules

MAJCOM—Major Command

MSL—Mean Sea Level

NAS—National Airspace System

ORM—Operational Risk Management

PMC—Partial Mission Capable

R/C—Radio Control

SOF—Supervisor of Flying

Stan/Eval—Standardization and Evaluation

SUA—Special Use Airspace

SUAS—Small Unmanned Aircraft System

SUAS-E—Small Unmanned Aircraft System Evaluator

SUAS-I—Small Unmanned Aircraft System Instructor

SUAS-O—Small Unmanned Aircraft System Operator

TTP—Tactics, Techniques and Procedures

UAV—Unmanned Aerial Vehicle

UAS—Unmanned Aircraft System

USAF—United States Air Force

VFR—Visual Flight Rules

VMC—Visual Meteorological Conditions

Terms

Airlift—Aircraft is considered to be performing airlift when cargo is carried.

Air traffic—Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

Bingo Fuel/Battery—The computed fuel or battery capacity remaining at a point in flight that will allow safe return to the point of intended landing with required reserve.

Catastrophic failure—Any failure that leads to the loss or destruction of the UA.

Command Chief Operator—A SUAS operator assigned to HQ AFMC/A3V or an appointee that assists the HQ Stan/Eval team and conducts flight evaluations on behalf of the headquarters.

Critical Phase of Flight—Takeoff, low level (below MSA defined by 14 CFR 91.119), approach and landing.

Director—AFMC civilian equivalent having the same authority as a Squadron Commander

Direct Instructor Supervision—Supervision by an instructor of like specialty with immediate access to controls (for pilots, the instructor must occupy either the pilot or copilot seat).

Due Regard—Operational situations that do not lend themselves to International Civil Aviation Organization (ICAO) flight procedures, such as military contingencies, classified missions, politically sensitive missions, or training activities. Flight under “Due Regard” obligates the military aircraft commander to be his or her own air traffic control (ATC) agency and to separate his or her aircraft from all other air traffic. (See FLIP General Planning, section 7).

Estimated Time In Commission (ETIC)—Estimated time required to complete required maintenance.

Evaluation Form—Worksheet used to document any evaluation to prepare the AF Form 8.

Evaluator (SUAS-E)—A SUAS crewmember who conducts evaluation of SUAS-Os, SUAS-Is and evaluators in designated SUAS and promotes safety among crew members. Evaluation includes air vehicle operation, qualification, unit employment, visual flight, and crew performance.

Execution—Command-level approval for initiation of a mission or portion thereof after due consideration of all pertinent factors. Execution authority is restricted to designated command authority.

External Operator (EO)—The SUAS crewmember who, in the absence of full automatic takeoff and landing systems, visually controls the UA flight path, generally during takeoff and/or landing.

Familiar Field—An airport in the local flying area at which unit assigned aircraft routinely perform transition training. Each operations group commander will designate familiar fields within their local flying area.

Fix—A position determined from terrestrial, electronic, or astronomical data.

Fuel—

Normal Fuel—Fuel (battery charge) on initial or at the final approach fix such that the aircraft can land with the fuel reserves specified in 11-502 Vol 3, para 2.2. (N/A for Group 1 SUAS)

Minimum Fuel—Fuel/Battery state, where, upon reaching the destination, the aircraft can accept little or no delay due to having less than Normal Fuel (or battery charge). This is not an emergency situation but merely indicates an emergency situation is possible should any undue delay occur. (Defined as approaching minimum useable battery capacity for Group 1 SUAS.)

Emergency Fuel—Fuel/Battery state requires immediate traffic priority to safely recover the aircraft. An emergency will be declared and the aircraft immediately recovered at the nearest suitable field. (Defined as minimum useable battery capacity for Group 1 SUAS.)

Initial Cadre—Those personnel assigned to conduct flight testing of experimental, developmental, or new aircraft for which there are no established formal training programs nor standardized evaluation criteria. Initial Cadre designations are appropriate through Initial Operational Capability.

Instructor (SUAS-I)—A SUAS crewmember who conducts training and evaluation of SUASOs and SUAS unit trainers in designated SUAS and promotes safety among crew members. Training and evaluation include air vehicle operation, qualification, unit employment, visual flight, and crew performance.

Instructor Supervision—Supervision by an instructor of like specialty (see also Direct Instructor Supervision).

Internal Operator (IO)—An SUAS crewmember that operates the UA from within a control station that exercises complete control over the air vehicle.

Inter-fly—The exchange and/or substitution of operators and aircraft between other MAJCOMS and AFMC. These forces are not gained by AFMC.

Knock-it-Off—A term any crewmember may call to terminate a training maneuver. Upon hearing “knock-it-off” the crew will establish a safe altitude, airspeed and return the aircraft power and flight controls to a normal configuration.

Landing—For purpose of this AFI, includes all actions appropriate to transition the UA from flight to the ground (e.g., recovery, wheeled or skid landing, parafoil recovery, deep stall landing, arrested engagement, etc.)

Landing Zone (LZ)—An area of sufficient size to allow discharge or pickup of passengers or cargo by touchdown or low hover.

Lead SUAS-O—The person who has been designated as Lead SUAS-O (Pilot-In-Command-equivalent) before or during the flight. The person who has final authority and responsibility for the operation and safety of flight, has been designated as Lead-SUAS-O before or during the flight, and holds the appropriate qualifications, as appropriate, for the conduct of the flight. The responsibility and authority of the pilot in command as described by 14 CFR 91.3, *Responsibility and Authority of the Pilot in Command*, apply to the Lead SUAS-O. The Lead SUAS-O position may rotate duties as necessary with equally qualified operators. The individual designated as Lead SUAS-O may change during flight. See “Pilot In Command” for further details.

Letter of “X”s—A document used in AFMC, signed by appropriate authority, that lists each assigned/attached operator’s aircraft designation, crew position, and mission qualifications.

Local Training Mission—A mission scheduled to originate and terminate at home station (or an off-station training mission), generated for training or evaluation and executed at the local level.

Low Altitude Navigation Leg—Low altitude navigation leg is that portion of the route designed primarily for low altitude flight; does not include segments intended for descent into and climb-out from the route.

Maintenance Status—

Code 1—No maintenance required.

Code 2 (Plus Noun)—Minor maintenance required, but not serious enough to cause delay. Add nouns that identify the affected units or systems, i.e. hydraulic, ultra high frequency (UHF) radio, radar, engine, fuel control, generator, etc. Attempt to describe the nature of the system malfunction to the extent that appropriate maintenance personnel will be available to meet the aircraft. When possible, identify system as mission essential (ME) or mission contributing (MC).

Code 3 (Plus Noun)—Major maintenance. Delay is anticipated. Affected units or systems are to be identified as in Code 2 status above.

Manmade Obstructions—Structures which present a hazard to flight. Structure height is measured from the ground-base.

Mission—1. The task, together with the purpose, that clearly indicates the action to be taken and the reason therefore. 2. In common usage, especially when applied to lower military units, a duty assigned to an individual or unit; a task. 3. The dispatching of one or more aircraft to accomplish one particular task.

Mission Commander (MC)—The designated individual tasked with the overall responsibility for the operation and safety of the SUAS mission.

Mission Contributing—Any degraded component, system, or subsystem which is desired, but not essential to mission accomplishment.

Mission Essential (ME)—A degraded component, system, or subsystem which is essential for safe aircraft operation or mission completion.

Off-Airport—Any location used to launch or recover an unmanned aircraft that is not considered an airport (i.e., an open field).

Off Station Training Flight—A training flight that originates or terminates at other than home station that is specifically generated to provide the operators experience in operating away from home station.

Operational Risk Management (ORM)—A logic-based common sense approach to making calculated decisions based on human, machine, mission, and media factors before, during, and after Air Force operations. It enables commanders, functional managers and supervisors to maximize operational capabilities while minimizing risks by applying a simple systematic process appropriated for all personnel and Air Force functions.

Operational Site—An LZ that has (1) been surveyed by an instructor pilot (IP) experienced in remote operations to ensure no hazards exist, (2) a photograph available for operators to study the site prior to landing and (3) approval from the responsible FOA to be designated an operational site. Whenever practical, operational sites will have permanently installed and properly maintained wind indicators (wind sock, streamer, etc.).

Originating Station—Base from which an aircraft starts on an assigned mission. May or may not be the home station of the aircraft.

Over Water Flight—Any flight that exceeds power off gliding distance from land.

Pilot in Command (PIC)—For SUAS operations, the term “Lead SUAS-O” is used as the PIC-equivalent role in lieu of the term “PIC.” The person who has final authority and responsibility for the operation and safety of flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight. The responsibility and authority of the pilot in command as described by 14 CFR 91.3, *Responsibility and Authority of the Pilot in Command*, apply to the unmanned aircraft PIC-equivalent, the Lead SUAS-O. The pilot in command position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

Range Control Officer—Designated official in charge of ensuring range safety. Final authority for range entry and weapon employment on the range.

Significant Meteorological Information (SIGMET)—Area weather advisory issued by an ICAO meteorological office relayed to and broadcast by the applicable ATC agency. SIGMET advisories are issued for tornadoes, lines of thunderstorms, embedded thunderstorms, large hail, sever and extreme turbulence, severe icing, and widespread dust or sand storms. SIGMET frequently covers a large geographical area and vertical thickness. They are prepared for general aviation and may not consider aircraft type or capability.

Squadron Top 3—Squadron Assistant Director of Operations (ADO), Director of Operations (DO), Commander (CC).

Takeoff—For purposes of this AFI, includes all actions required to transition the UA from ground to flight (e.g. launch, throwing, catapulting, wheeled takeoff, etc.)

Temporary-2 (T-2) Modification—T-2 modifications are temporary modification required to support research, development, test, and evaluation (RDT&E), in service testing of potential replacement items (form, fit, and function), and for aircraft/stores compatibility testing.

Test Conductor—Final authority for test related missions. Manages the mission flow and test card execution to ensure test objectives are met without increasing prior mitigated risk.

Training Mission—Mission executed at the unit level for the sole purpose of SUAS operator training for upgrade or proficiency. Does not include operational missions as defined in this AFI.

Unilateral—Operations confined to a single service.

Unmanned Aircraft (UA)—An aircraft capable of flight beyond visual line of sight under remote or autonomous control for military purposes, primarily for reconnaissance, surveillance, and other intelligence gathering missions, as well as for the adjustment of artillery and mortar fire, and may be used in an aerial target spotting/identification role. A UA can be expendable or recoverable, can carry a payload, is not operated for sport or hobby, and does not transport passengers or crew. For purposes of compliance with 14 CFR 1, subchapter A, part 1.1., UAs are to be considered “aircraft,” typically either an “airplane” or “rotorcraft,” as defined in 14 CFR 1, subchapter A, part 1.1. (FAA refers to these aircraft as remotely operated aircraft (ROA)).

Unmanned Aircraft System (UAS)—The entire unmanned aircraft system used to operate, communicate, and fly an unmanned aircraft (UA). This includes the Unmanned Aircraft (UA), Ground Control Station (GCS), Remote Video Terminal (RVT), and Communications equipment; can also include video capture device and portable computer.

Visual Contour Flight—Operation at a predetermined altitude above the ground, following contours visually using the radar altimeter to crosscheck altitude. An operating radar altimeter is required.

Visual Line-of-Sight—A method of control and collision avoidance that refers to the pilot or observer directly viewing the unmanned aircraft with human eyesight. Corrective lenses (spectacles or contact lenses) may be used by the pilot or visual observer. Aids to vision, such as binoculars, field glasses, or telephoto television may be employed as long as their field of view does not adversely affect the surveillance task.

Visual Reconnaissance—Aerial survey of areas, routes, or LZs.

Zero Fuel Weight—Weight, expressed in pounds, of a loaded aircraft not including wing and body tank fuel. All weight in excess of the maximum zero fuel weight will consist of usable fuel.

Attachment 2***GROUP 1******Section A2A—General Information***

A2.1. Operating Guidance. In the absence of specific guidance operate the SUAS IAW this instruction and approved test plans.

Attachment 3

GROUP 2

Section A3A—General Information

A3.1. Operating Guidance. In the absence of specific guidance operate the SUAS IAW this instruction and approved test plans.

Attachment 4***GROUP 3******Section A4A—General Information***

A4.1. Operating Guidance. In the absence of specific guidance operate the SUAS IAW this instruction and approved test plans.